

## Box 1

### Is euro area financial stress becoming more global?

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**Financial stress indices have become a common tool to measure the current state of (in)stability in an economy's financial system as a whole or major parts of it.**<sup>2</sup> Recent developments in a particular variant of such an index for the euro area, namely the composite indicator of systemic stress (CISS)<sup>3</sup>, reveal three distinct features: *First*, since mid-2013, the volatility of the CISS has gradually increased, with several large spikes in the last years (see Chart A). This presumably relates to major local and global stress events and may imply heightened risks to financial stability going forward. *Second*, the euro area CISS has displayed a gradual upward trend over this same period. More recently, the immediate stress following the UK referendum outcome lifted the indicator temporarily to levels last observed at the height of the euro area sovereign debt crisis. *Third*, the euro area index's more pronounced swings since 2013 have been correlated with similar movements in other major economic regions – in either the US or Chinese CISS, or both. This may suggest that euro area financial stability conditions have become more intertwined with the international environment.

**Understanding the driving factors behind financial stress and the underlying frictions is inherently difficult.** For instance, empirical research for the euro area finds that past outcomes for a broad range of macroeconomic and financial variables do not have material predictive power for the CISS.<sup>4</sup> In addition, contemporaneous relationships between financial stress and other variables

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<sup>2</sup> For a literature survey, see Kliesen, K. L., Owyang, M. T. and Vermann, E. K., "Disentangling Diverse Measures: A Survey of Financial Stress Indexes", *Federal Reserve Bank of St. Louis Review*, September/October 2012, pp. 369-398.

<sup>3</sup> The euro area CISS was first published in the special feature on "Systemic risk methodologies", *Financial Stability Review*, ECB, June 2011. Its concept is described in Holló, D., Kremer, M. and Lo Duca, M., "CISS – A composite indicator of systemic stress in the financial system", *Working Paper Series*, No 1426, ECB, March 2012. Regular data updates of the euro area CISS are available from the ECB's Statistical Data Warehouse.

<sup>4</sup> See Kremer, M., "Macroeconomic effects of financial stress and the role of monetary policy: a VAR analysis for the euro area", *International Economics and Economic Policy*, Vol. 13, 2016, pp. 105-138.

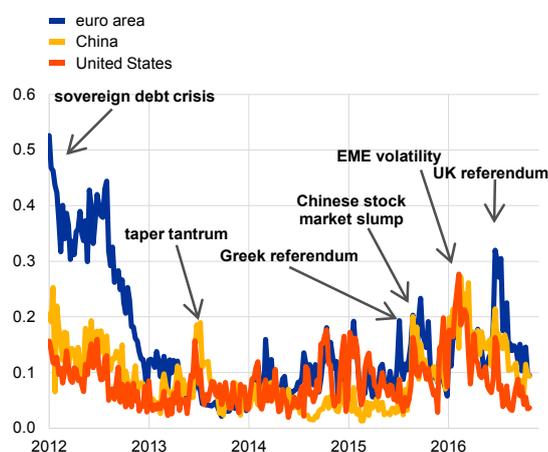
are often weak, and if they show up as stronger, it is not clear how to interpret the direction of causality. For example, the CISS seems to co-move simultaneously with measures of political uncertainty for individual euro area countries and the European Union as a whole. While it is possible that (in particular) extreme levels of financial stress might sometimes raise political uncertainty immediately, the political uncertainty caused by the UK referendum probably drove up financial stress at least temporarily. Survey-based measures of macroeconomic uncertainty in the euro area, by contrast, do not seem to be associated with recent developments in financial stress.

### Chart A

Financial stress waxed and waned worldwide...

#### Composite indicators of systemic stress

(Jan. 2012 – Oct. 2016; weekly data; 0 (minimum) to 1 (maximum) range)



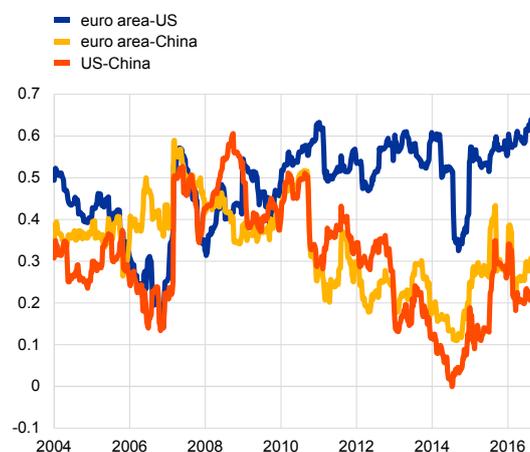
Sources: ECB and ECB calculations.  
 Note: The CISS methodology is described in Holló, D., Kremer, M. and Lo Duca, M., "CISS – A composite indicator of systemic stress in the financial system", *Working Paper Series*, No 1426, ECB, March 2012.

### Chart B

...while becoming more strongly correlated globally, albeit starting from low levels

#### Time-varying correlation coefficient between weekly changes in the CISS for each pair of countries

(Jan. 2004 – Oct. 2016; weekly data)



Sources: ECB and ECB calculations.  
 Note: Time-varying correlation coefficients estimated using a multivariate integrated GARCH(1,1) model for weekly changes in the CISS for the euro area, the United States and China.

**An exercise decomposing the CISS into constituent components suggests intensified banking problems are a further potential domestic driver of financial stress.** Of the five sectors captured by the CISS, the by far strongest contribution to recent changes stems from increased stress in the financial intermediaries sector. The contributions from money, bond, equity and foreign exchange markets are, in contrast, relatively low. Hence, weak profitability and legacy risks in the banking sector may account for the recently more elevated levels of stress in the euro area compared with, for example, the United States or the United Kingdom.

**Regarding international factors, there was an increase in the cross-border correlation of financial stress.** The time-varying correlation coefficients between weekly changes in the CISS for the euro area, the United States and China show a marked increase in the degree of stress synchronisation for all country pairs since mid-2014 (see Chart B). However, the correlation coefficients picked up from relatively low levels and did not uniformly increase towards historically high values. Nonetheless, the stronger cross-country linkages with respect to financial stress may still suggest an increasing role of global factors for domestic financial stability conditions.

**Increased cross-border correlation of financial stress can result from a stronger impact of truly common factors (e.g. global preference shifts) or increased spillover effects from**

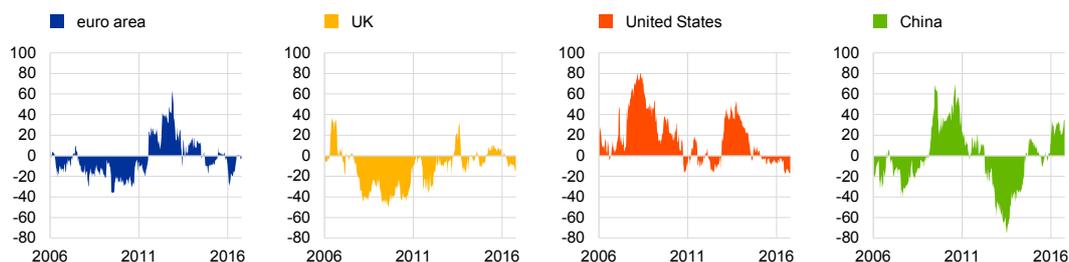
**stress originating from abroad.** An econometric spillover analysis that disentangles domestic from foreign shock contributions to the forecast error variance of the euro area, US, UK and Chinese CISS finds that when viewed over the full sample (2004-16), the United States clearly dominated as the main source of international financial stress, i.e. was a net sender of stress (see Chart C). This holds particularly true for the global financial recession (2007-09) as well as for the period from 2013 to mid-2014 when market participants started to price in expectations about an imminent tightening cycle in US standard and non-standard monetary policy (“taper tantrum”). That said, the euro area became the dominant source of stress during the sovereign debt crisis, while being a net receiver of stress at other times. The latter fact is even more pronounced for the United Kingdom, although it emerged as a moderate net sender of stress in most of 2015.<sup>5</sup> Finally, China became the sole net sender of stress in 2016 in the context of increasing financial strains in its domestic financial sector. The results also suggest that China contributed strongly to the international transmission of financial stress shocks in the years 2009 and 2010. In those years, however, China seemed to act like a stabilising force since its stress index fell more rapidly and strongly from the global crisis peaks than in the other three economies.

## Chart C

### Stronger stress spillovers from China

#### Net forecast error variance contributions at the country level

(Jan. 2006 – Oct. 2016; weekly data, percentage of total forecast error variance)



Sources: ECB and ECB calculations.

Notes: Spillovers computed within the vector autoregression (VAR) forecast error variance decomposition framework as suggested by Diebold, F. X. and Yilmaz, K., “Better to give than to receive: predictive directional measurement of volatility spillovers”, *Economic Journal*, Vol. 119, 2012, pp. 158-171. The VAR with four lags is estimated over a two-year moving window for weekly data of the euro area, US, UK and Chinese composite indicators of systemic stress. The time series show for each country the sum of the contributions of shocks in that country to the forecast error variance in the other three countries (“spillovers sent”), less the sum of the contributions of shocks in the other countries to the forecast error variance of the country at hand (“spillovers received”).

**All in all, the recently somewhat more elevated levels of financial stress in the euro area – as measured by the CISS – seem to reflect a combination of both domestic and external factors.** In particular, increased tensions in the domestic financial intermediaries sector as well as persistent international stress spillovers, in particular originating from China in line with the country’s increased role in global trade and financial flows, appear to be major explanatory factors. Despite this rise in the euro area measure of financial stress and empirical studies that show that the CISS has strong and robust predictive power for economic activity, most recent levels of financial stress are still relatively low by historical standards and thus not likely to pose material risks for real economic activity in the euro area.<sup>6</sup>

<sup>5</sup> The potential spillovers of financial stress from the UK referendum in June 2016 are too recent to have a statistically significant impact within the applied spillover regression framework.

<sup>6</sup> See Kremer, M., “Macroeconomic effects of financial stress and the role of monetary policy: a VAR analysis for the euro area”, op. cit.